

Pit Viper Deployment in C-104 Heel Pit

The need for remote systems to support Tank Farm Operations was identified in the Hanford Science and Technology Needs/Opportunities Statement RL-WT021, "Cleaning, Decontaminating and Upgrading Hanford Pits," dated September 1998. The intent was to identify a commercial *off-the-shelf* remote system that could demonstrate successful nuclear deployment and application. The system would incorporate key attributes such as: a simple turn key system, full reach capability within tank farm pits, compatible with existing tank farm tooling and equipment, and capable of deploying several tools or end effectors to enhance and accelerate work activities in highly contaminated pit environments.

Pit Viper System consists of a FERMEC 860SB backhoe, a Cybernetix SAMM remote manipulator, cameras and associated viewing equipment, and an operator console. The Pit Viper was procured to perform the following types of activities:

- In-pit size reduction
- Debris removal
- Decontamination/fixative application
- Paint preparation and painting
- Concrete repair (cracks)
- Pit riser plug/drain plug removal
- Radiation mapping and characterization

Procurement and deployment of the Pit Viper system was a cooperative effort between the Tanks Focus Area (TFA), Robotics Crosscut Program (RBX), CH2M Hill Hanford Group (CHG), Numatec Hanford Corporation (NHC), Pacific Northwest National Laboratory (PNNL), and the Oak Ridge National Laboratory (ORNL). Cold testing, training, and mockup preparation was conducted at the Volpentest HAMMER Training and Education Center. In December of 2001, CHG and PNNL successfully completed a hot deployment and limited demonstration of the Pit Viper capabilities in the 241-C-104 heel pit. The deployment supported design and construction activities for Hanford Project W-523, 241-C-104 Waste Retrieval System. The scope of the hot demonstration included:

- Cutting and removal of foam insulation that had separated from the pit cover plate and prevented visual inspection work in the pit
- Removal of debris, trash, and other objects from the pit floor
- Scraping/cleaning of a section of the pit floor
- Scraping/cleaning of a section of a pit wall
- Application of high-pressure spray demonstrating paint preparation, painting, decontamination and fixative application techniques

There are over 600 pits in the Hanford tank farms and a majority of these pits must be upgraded and refurbished to meet regulatory compliance to support waste transfers to the Hanford Waste Treatment Plant. Pit upgrades and refurbishment is one of the most dose-intensive activities performed in Tank Farms under Hanford's River Protection Project (RPP). The Pit Viper provides a unique system to support intrusive operations in highly contaminated Hanford tank farm pit environments. Prior to developing the Pit Viper system the current approach for most pit operations consisted of long reach pole tools and mirrors manually operated by personnel at the edge of the pit. Deployment of the Pit Viper reduces radiation exposure, improves worker safety, and provides the opportunity for efficient and remote tool manipulation.

Contact: [Dennis Crass](#), NHC (372-2034)



PIT VIPER ~ Debris removal (absorbent) [DSC0307.jpg]



PIT VIPER ~Wall cleaning with grinder/flapper wheel
[DSC00314.JPG]



PIT VIPER ~ Brushing/scooping debris off floor.
[DSC00333.JPG]



Dennis Crass, Numatec Hanford Corporation (NHC)

Current Position: Manager of SST Retrieval Systems Definition

Experience: Mr. Crass has worked at Hanford since 1985 and has over twenty-five years experience as a Mechanical Design Engineer, Lead Engineer, and Project Manager emphasizing technical application, installation, and deployment of remote tooling, waste retrieval systems, and underwater inspection and repair equipment. He currently works for Numatec Hanford Corporation as Manager of SST Retrieval Systems Definition, supporting CHG SST retrieval projects at Hanford. Mr. Crass was the TFA Principal Investigator and Coordination Manager for the Pit Viper Project, coordinating activities among the TFA, PNNL, and CHG to procure and deploy the Pit Viper in tank farms.

Pit Viper

Sharon Bailey, Pacific Northwest National Laboratory (PNNL)

Current Position: Senior Program Manager

Education: Industrial Engineering, University of Washington

Experience: Ms. Bailey is a senior program manager with extensive experience in managing large, interdisciplinary programs and teams in several technology areas including energy efficiency and robotics. She has more than 15 years experience in managing cutting edge technology development and deployment programs. Programs with first-of-a-kind systems deployments are her expertise. She has experience with large, high profile, high technical risk procurements including a \$4.3M robotic arm fixed price contract with international subcontractors. She is an expert at running projects under Battelle and DOE systems, and is very well versed at Battelle's contract and financial systems. She has a successful history of dealing with difficult and sensitive client relations and situations, and complex and highly visible contractual negotiations.



Update on FY 2002 Science and Technology Needs Statements

On December 17, CHG transmitted final River Protection Project (RPP) Tank Farm Contractor (TFC) Fiscal Year (FY) 2002 Science and Technology Needs Statements. Office of River Protection and Washington Department of Ecology comments had been addressed and appropriate changes made. Those changes requiring revision to the Integrated Planning, Accountability, and Budgeting System-Information System (IPABS-IS) at DOE-Headquarters were incorporated into IPABS. Included in the attachments to the submittal were cover sheets for all need statements complete with signatures from the responsible CHG and ORP staff. Support from the CHG and Pacific Northwest National Laboratory (PNNL) staff in working through this process was greatly appreciated. Contact: [Ken Gasper](#), CHG (373-1948)

TMS Accelerated Site Technology Deployment (ASTD) Proposal A Winner

ORP Topographical Mapping System (TMS) proposal submitted to the DOE's Office of Science and Technology's ASTD program near the end of November was selected to receive ASTD funding of \$579,000. Together with matching funds currently in the RPP baseline, this funding will support the deployment of this cost effective technology which will also reduce personnel radiation exposure during Single Shell Tank retrieval. The FY02 portion (\$479K) of this new funding should be available by February 1. ORP and CHG have committed to measure and calculate residual waste in the retrieved Single Shell Tanks (SSTs) in the Tri-Party Agreement's Single-Shell Tank Waste Retrieval Actions (M-45-00-01A). This measurement technique will support the primary criterion to successful closure of the retrieved SSTs to remove 99% of the radioactive waste from the tank.

The new work proposes to adapt and deploy commercially available video and laser based range-finding and mapping equipment and systems to provide a topographical mapping system capable of providing remediation personnel with the retrieval performance and efficiency data that is critical to accelerating tank waste retrieval and closure. The proposed approach is based upon a video inspection system design that has been successfully used at Hanford for years. The system will include improvements resulting from lessons learned with the prototype TMS adapted by PNNL that is currently installed in Tank U-107.

This system is scheduled to be deployed into SST 241-S-112 in the last quarter of FY 2002. Subsequent deployments are currently being planned for SSTs S-102

Upcoming Events

January 2002 -- Hanford
Initiation of Proof-of-Concept Salt Dissolution Test in Tank U-107 together with the Topographical Mapping System
Contact: [Dan Baide](#), CHG (376-3274)

January 29-30, 2002
LDMM Ex-Tank Technology Down-Select Workshop
Contact: [Mike Boger](#), CHG (376-3355)

March 11-14, 2002, Salt Lake City
Tanks Focus Area (TFA) FY 2002 Midyear Review
CHG Contact: [Ken Gasper](#) (509) 373-1948
Others Contact: [Tom Brouns](#) (509) 372-6265

and C-104. The proposed approach is applicable to site remediation activities across the DOE complex. A letter from the Savannah River Site attached to the proposal stated their need for this type of technology. Roger Bauer, S-112 Project Manager will serve as CHG's Principal Investigator on the TMS effort.

Contact: [Roger E Bauer](#), CHG (376-5908)

Mechanics of Bubbles

Recently Phil Gauglitz of Pacific Northwest National Lab released a document "Final Report Mechanics of Bubbles in Sludges and Slurries," PNNL-13748. The overall objective of this study was to create a better understanding of the mechanics of bubbles retained in high-level waste sludges and slurries. The relevance of basic theoretical and experimental method development to Hanford waste has resulted in an entirely new understanding of bubble mechanics and waste microstructure in Hanford waste tanks. The most significant conclusion for Hanford tanks is that a new waste microstructure and bubble configuration must be postulated to explain the volume-pressure hysteresis, one in which the bubbles are trapped in the pore spaces of a settled bed of salt crystals, and the pore space itself is filled with a yield-stress fluid.

Contact: [Phil Gauglitz](#), PNNL, 509 372-1210

Recently Published Reports

PNNL-13702, TFA Multi-year Program Plan FY02-FY06
Contact: [Tom Brouns](#), TFA (372-6265)

HNF-9545, Results of Shear Studies with 241-AY-101 Sludge
Contact: [R. W. Warrant](#), FH (373-2529)

Projects Funded at CHG in FY 2002 by the Office of Science and Technology

RL01TA21 ~ TPO/STCG Administration (FY02-\$275K; FY01CO-\$21K) ~ Billie Mauss, Ken Gasper

RL08WT21 ~ CHG Safety

Task A: Hanford EN Corrosion Probe Development and Deployment (FY02-\$100K; FY01CO-\$22K plus \$16K in RL09WT41) ~ Gar Norman

Task B: Tank Leak Mitigation (FY01CO-\$26K) ~ Jerry Cammann

Task B: Support Technical Needs and Meet with EN Probe Users (FY02-\$10K) ~ Mark Roberts

Task C: TSAFT Ultrasonic Inspection Improvement (FY02-\$420K) ~ Chris Jensen / Gary Duncan

RL08WT51 ~ TFA Retrieval Technical Integration Manager (FY02-\$225K; FY01CO-\$65K) ~ Pete Gibbons

RL09WT22 ~ CHG Retrieval and Closure

Task A: Alternate Mixing System – ADMP for SRS (FY02-\$25K) ~ Ann-Marie Choho / Cary Graves

Task B: Low Water Volume Retrieval Technology – Saltcake Dissolution Retrieval for S-112 (FY02-\$150K; FY01CO-\$105K) ~ Roger Bauer / Brian Brendel / Jerry Cammann

Task C: Low Water Volume Retrieval Technology – Saltcake Dissolution Retrieval for S-112 (FY02-\$200K) ~ Roger Bauer / Brian Brendel / Jerry Cammann

Task D: Alternative Pulse Jet Retrieval Technology – Saltcake Dissolution Retrieval for S-102 (FY02-\$250K; FY01CO-\$201K) ~ Dennis Crass

Task E: Hanford Vehicle-based Retrieval – SST C-104 Project W523 (FY02-\$350K; FY01CO-\$66K) ~ Keith Carpenter

Task F: Hanford Cold Test Facility Support (FY02-\$200K; FY01CO-\$191K) ~ Greg McLellan / Jerry Cammann

Task G: Pipeline Blockage Locating and Unplugging in Buried Lines (FY02-\$50K; FY01CO-\$105K) ~ Ann-Marie Choho / Cary Graves

FY 2002 Planned Deployments

The following deployments are currently planned for FY 2002; if you aware of any others, please advise.

Contact: Bill Kuhn, PNNL (375-2944)

TW03 – Tank Farm Operations

- Initiate Proof-of-Concept Testing of Low Volume Density Gradient (LVDG) Process in conjunction with Tank U-107 Saltwell Pumping
- Tank Riser Pit Decontamination (Pit Viper) System Deployment in C-104 Pit [Completed December 19, 2001]
- Crawler-Mounted Sensor for DST Knuckle NDE (RONDE) Using TSAFT Technology

TW04 – Waste Retrieval, Storage, and Disposal Operations

- F&R use of Saltcake Dissolution Test Results
- Densimeter for Slurry Characterization

CHG Point of Contact: Ken Gasper ■ 509-373-1948 ■ Kenneth_A_Ken_Gasper@rl.gov

If you have information that would be of interest to our readers, please call it to the attention of the CHG Point of Contact. If you would like to be added to electronic distribution of this report, please send your name and e-mail address to linda.page@pnl.gov.